G. B. STONE.

IGNITION CONTROLLER.

APPLICATION FILED JAN. 10, 1917.

1,338,336. **Patented Apr. 27, 1920.**

Fig. 1.

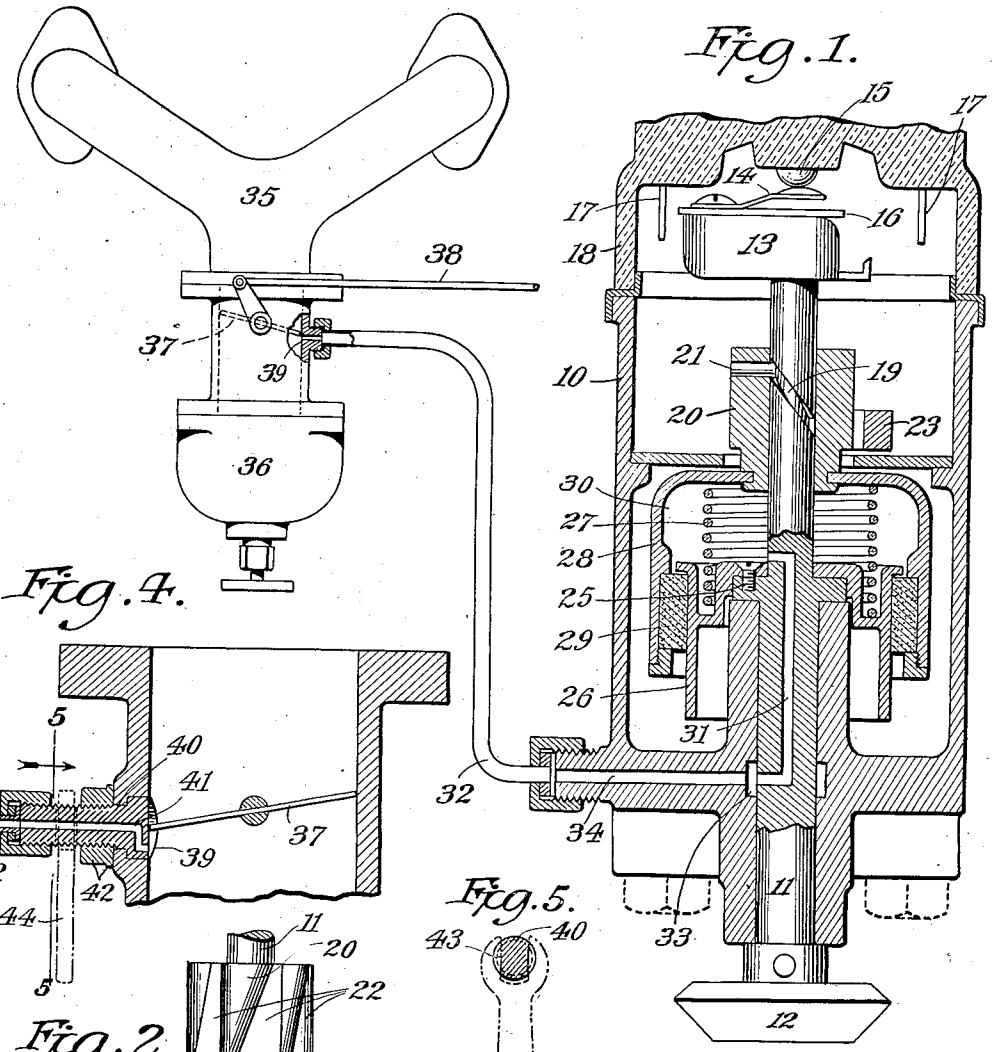


Fig. 4.

Fig. 5.

Fig. 2.

Fig. 6.

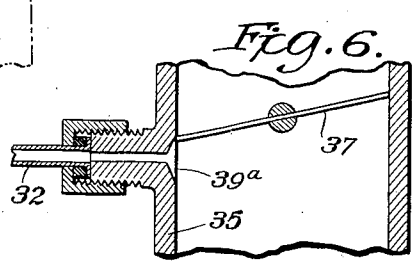
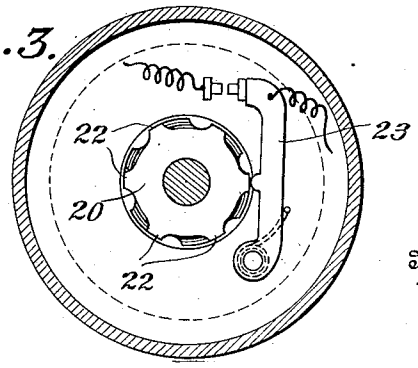


Fig. 3.



Inventor

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UNITED STATES PATENT OFFICE.

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IGNITION-CONTROLLER.

1,338,336. Specification of Letters Patent. Patented Apr. 27, 1920.

Application filed January 10, 1917. Serial No. 141,553.

To all whom it may concern:

Be it known that I, GUY B. STONE, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Ignition-Controllers, (Case A,) of which the following is a full, clear, and exact description.

This invention relates to certain new and useful improvements in ignition controllers and has for its object the provision of a device which will automatically advance the ignition timer or sparking device so that the spark in the engine cylinders will always occur as early as the operating conditions of the engine will permit and at the same time retard the timer when the engine is idling.

The present invention relates to an improvement in the device shown in the Nickerson Patent No. 1,139,707.

Other objects of the present invention will be pointed out in detail in the accompanying specification, shown in the drawing and more particularly pointed out in the appended claims.

In the drawing:

Figure 1 shows a sectional view of a timer and distributer, and also shows somewhat diagrammatically the connection to the intake pipe of an internal combustion engine.

Figs. 2 and 3 are detail views of the timer and the timer cam.

Fig. 4 is a detail view showing one embodiment of the connection with the intake manifold.

Fig. 5 is a detail view of one of the parts shown in Fig. 4 and shows the manner of adjusting the position of the parts by means of a wrench.

Fig. 6 is a detail view of a modified connection to the intake pipe.

In more detail in the drawings,

In Figs. 1, 2 and 3, 10 is the timer casing and is fixed to any rigid part of the engine by a bracket not shown. The casing has revolubly mounted therein a shaft 11 which carries a gear 12 adapted to mesh with a suitable driving gear on the engine crank shaft or cam shaft.

The shaft 11 carries at its upper end the usual distributer segment block 13 having the usual brush 14 coöperating with fixed secondary terminal 15, and a segment 16 which successively establishes a secondary circuit with the poles 17 which are carried in a distributer cap 18 of well known type. The shaft 11 is provided with a spiral slot 19 and upon the shaft there is a timer cam 20 which has a pin 21 projecting into the spiral slot. The cam 20 is provided with a number of raised portions 22 having straight parallel forward edges and tapering rear edges (see Fig. 2). These raised portions of the timer cam coöperate with the usual pivoted spring pressed timer lever 23 and establish and interrupt the primary circuit in the well known manner. It will be understood that if the cam 20 is shifted downward on the shaft, the engagement of the pin 21 in slot 19 will advance the cam angularly relatively to the shaft 11 and to the timer lever 23, and this action is employed for advancing or retarding the time of ignition. By reason of the tapered arrangement of the rear edges of the raised portions 22, the duration of the closed period of the primary circuit will increase, and the open period will decrease relatively to each other as the cam 21 moves from the upper to the lower position on the shaft. In this way the actual time of each closed period is maintained constant and consequently the spark is maintained at the same intensity for different engine speeds.

In order to move the timer cam longitudinally on its shaft and to thereby advance or retard the spark I provide a suction device which will now be described.

Attached to a shoulder 25 on shaft 11 is a cylindrical shell 26, having a closed upper end, suitably recessed to receive a coil spring 27. Concentric with shell 26 there is a second bell shaped cylindrical shell 28 which carries between it and shell 26 an annular graphite sealing ring 29. Shell 28 is normally maintained in the position shown in Fig. 1 by means of the coil spring 27, but if the air pressure within the shells, *i. e.*, in chamber 30 be reduced shell 28 will telescope downward over shell 26 and draw the timing cam 20 down with it. Cam 20 is relatively revoluble with respect to shell 28 and therefore is angularly advanced with respect to shaft 11 and timer lever 21 when shell 28 descends under the influence of suc-

tion. It will be understood that normally the spring 27 will act to maintain cam 20 in retarded position. It will be understood that the purpose of sealing ring 29 is to provide an air tight connection between cylinders 26 and 28 and at the same time permit relative freedom of movement therebetween.

Suction connections to inlet manifold.

In order to reduce the air pressure in chamber 30, I provide a duct 31 in shaft 11, this duct leading into chamber 30 at its upper end and at its lower connecting with a pipe 32 through an annular port 33, and duct 34. In Fig. 1, 35 is the intake manifold or conduit of the engine having the usual connection with the carbureter 36. The throttle valve 37 is of the butterfly type and is operated by the usual operating connections 38. The pipe 32 is connected to the manifold as shown in Fig. 1, and the opening 39 is disposed just below the edge of the throttle valve when the latter is substantially in closed or idling position.

With previous suction controllers it has been the practice to dispose the orifice 39 above the throttle (when the latter is in substantially closed or idling position). With such previous constructions when the engine is idling the suction in pipe 33 and chamber 30 would be high thereby advancing the spark excessively which is objectionable for proper idling conditions.

By so disposing pipe 32 below the throttle this condition is obviated since the throttle valve by its movement past the orifice 39 is adapted to connect the controller with the inlet manifold below the throttle or above it. When the orifice is below the throttle the pressure in the controller is substantially that of the atmosphere, whereas when the orifice is above the throttle the pressure conditions in the controller will depend upon the manifold vacuum which in turn is dependent upon engine conditions.

In order to provide an adjustment for the position of the orifice 39 with respect to the throttle valve I provide the construction shown in Fig. 4. A nipple 40 having an eccentric duct is journaled in a recess in the manifold and held in any desired position by a lock nut 42. The nipple is flattened at 43 to receive a wrench 44, as shown in Fig. 5, and at the rear is provided with a suitable union to connect with pipe 32. The union is of such construction that the nipple can turn relatively to pipe 32. It will be understood that by turning the nipple 40 around, the orifice 39 can be adjusted with respect to the butterfly valve 37.

Fig. 6 shows another construction in which the orifice 39[a] at the end of the pipe 32 is slightly hollowed out to permit the flow of gas past the edge of the throttle as the same is opened. With this construction the change of pressure conditions is more gradual as will be readily understood.

The operation of the device will be readily understood. With idling conditions the ignition is retarded as the pressure within chamber 39 is substantially atmospheric and the coil spring 37 will maintain cylinder 28 elevated and cam 20 retarded. As the degree of suction within chamber 30 increases the cylinders 28 and 26 will telescope thereby contracting the spring 27 and lowering and advancing cam 20. The amount of advance will be determined by the suction conditions within the manifold and above the throttle and also by the tension of the coil spring. The suction conditions will also depend upon the position of the throttle and upon the speed of the engine.

It will be understood that my invention is susceptible of various modifications which will occur to those skilled in the art.

What I claim as my invention is more particularly pointed out in the appended claims.

1. In an ignition controller, the combination with an engine having an intake manifold and a throttle valve; of ignition timing means; and a suction controller therefor, said suction controller having a connection with the intake manifold at a point entirely below the throttle valve when the throttle valve is in substantially closed position, but arranged to be above a portion of said valve when opened a certain amount.

2. In an ignition controller, the combination with an engine having an intake manifold and a throttle valve; of vacuum actuated means for advancing the time of ignition; means for retarding the ignition; and means dependent upon the position of the edge of the throttle valve for establishing communication between said vacuum means and the intake manifold when the throttle is in other than idling position and for restricting such communication when the throttle valve is in idling position.

3. In an ignition controller, the combination with an engine having an intake manifold and a throttle valve; of a vacuum actuated means for advancing the time of ignition, said means having a conduit entering the intake manifold and at a point below the throttle when the latter is in idling position, but arranged to be above a portion of said valve when opened a certain amount.

4. In an ignition controller, the combination with an engine having an intake manifold and a throttle valve; of a vacuum actuated means for advancing the time of ignition, said means having a conduit associated therewith and leading through the wall of the intake manifold at a point below the throttle valve when the latter is in substantially closed position and adapted to be

above the throttle valve when the latter is opened.

5. In an ignition controller, the combination, with an engine having an intake manifold and a throttle valve; of a vacuum actuated means for advancing the ignition; and a conduit associated therewith and leading to the intake manifold at a point below the throttle valve when idling timing conditions are desired and above the throttle valve when advancing conditions are desired.

6. In an ignition controller, the combination, with an engine having an intake manifold and a throttle valve; of a vacuum actuated ignition timing means for controlling the time of ignition; and a duct leading thereto and having communication with the intake manifold at a point below the throttle valve, said throttle valve being adapted to pass the entrance of said duct and establish communication above the throttle valve for advancing the time of ignition.

7. In an ignition controller, the combination, with an engine having an intake manifold and a throttle valve; of an ignition timing means; and vacuum means for positioning the same, said vacuum means having provisions whereby the edge of the throttle valve controls the vacuum in the said vacuum means.

8. In an ignition controller, the combination with an engine having an intake manifold and a throttle valve; of means operating to advance the timing of the ignition in accordance with load or speed; and means for automatically retarding the time of ignition when the engine is idling; said first named means having provisions communicating with the intake manifold and dependent upon the position of the edge of the throttle valve for controlling the retardation or advancement of the time of ignition.

9. In an ignition controller, the combination with an engine having an intake manifold and a throttle valve; of a timer lever; a timing cam; a shaft to rotate the cam; and means for varying the angular relation of the cam and the said shaft to thereby advance or retard the time of ignition, said means comprising a means responsive to engine suction, and having provisions to cut down the amount of suction acting thereon when the engine is idling.

10. In an ignition controller, the combination with an engine having an intake manifold and a throttle valve; of an engine driven shaft; a timer lever; a timer cam having provisions for maintaining a varying extent of contact with the timer lever at varying cam positions, said cam being adapted to be shifted axially and angularly on the said engine driven shaft; and means responsive to suction conditions in the intake manifold for axially shifting the cam on the said shaft to thereby vary the timing of the ignition.

11. In an ignition controller, the combination with an engine having an intake manifold and a throttle valve; of a timer lever; an engine driven shaft; a timer cam slidable axially thereon and adapted to be angularly displaced with respect to the said shaft when slid to various axial positions; a suction actuated means for shifting the said cam for advancing the ignition; and means for rendering the suction ineffective to advance the cam when the throttle valve is in idling position.

12. In an ignition controller, the combination with an engine having an intake manifold and a throttle valve; of a timer lever; an engine driven shaft; a timer cam slidable axially thereon and adapted to be concurrently displaced angularly with respect thereto to vary the time of ignition, said cam having provisions for varying the duration of contact with the timer lever relatively to the duration of the interval of no contact when the cam is shifted to various axial positions; suction actuated means for shifting the said cam axially on the said shaft to thereby advance the cam angularly relatively to the shaft and advance the time of ignition; and means for rendering the engine suction ineffective to advance the cam when the throttle valve is in idling position.

13. In an ignition controller, the combination with an engine having an intake manifold and a throttle valve; of an ignition timing means; a suction device for actuating the said timing device; a duct leading from the suction device and terminating in an orifice disposed below the throttle valve when the latter is in idling position; and means for adjusting the position of the said orifice relatively to the throttle.

14. In an ignition controller, the combination with an engine having an intake manifold and a throttle valve; of an ignition timing means; a suction device for actuating the same; a duct leading to the inlet manifold from the said suction device, said duct leading in to the manifold at a point below the edge of the throttle when the latter is in substantially closed position, said throttle valve being adapted to move past the end of the duct and establish communication with the manifold above the same as the throttle opens; and means for adjusting the initial position of the duct opening with respect to the throttle valve.

15. In a controller, the combination with an engine having an intake manifold and a throttle valve; of an ignition timing means

including a timer and an engine driven member for driving the cam, and including suction operated means for effecting the relative displacements of the timer cam with respect to the engine driven member.

16. In an ignition controller, the combination with an engine having an intake manifold; of a suction controlled ignition timing device coöperating with the engine intake; and having provisions for maintaining the intensity of the spark constant for different engine speeds.

17. In an ignition controller, the combination with an engine having an intake manifold; of a suction controlled ignition timing device having provisions for advancing or retarding the spark in accordance with the suction of the engine and provisions for maintaining the intensity of the spark constant for different engine speeds.

18. In an ignition controller, the combination with an internal combustion engine; of an ignition timing device; and means for controlling the ignition timer in accordance with load and speed conditions of the engine, and for controlling the timing device in order to maintain the intensity of the spark constant for different engine speeds.

19. In an ignition controller, the combination with an engine having an intake manifold and a throttle valve; of a timer lever; a timing cam; a shaft to rotate the cam; and means for varying the angular relation of the cam and the shaft whereby to advance or retard the time of ignition, said means comprising a device responsive to engine suction for advancing the time of ignition and another device acting in opposition to said first device for retarding the time of ignition, said means having provisions for cutting down the amount of suction acting thereon when the engine is idling.

In testimony whereof I affix my signature.

GUY B. STONE.